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<b>(54) Title:</b> INDUSTRIAL PRINTER FOR USE WITH AT LEAST ONE CARTRIDGE OF CONSUMABLE MATERIAL <b>(54) Titre:</b> IMPRIMANTE INDUSTRIELLE APTÉ A RECEVOIR AU MOINS UNE CARTOUCHE DE CONSOMMABLE			
<b>(57) Abstract</b> <p>An industrial printer for use with at least one cartridge of consumable material is disclosed. The printer includes communication means using an electromagnetic connection (16, 17) to an electronic label (11, 12) on each cartridge (13, 14).</p>			
<b>(57) Abrégé</b> <p>L'invention concerne une imprimante industrielle apte à recevoir au moins une cartouche de consommable, qui comprend des moyens de communication par liaison électromagnétique (16, 17) avec une étiquette électronique (11, 12) disposée sur chaque cartouche (13, 14).</p>			

ABSTRACT OF THE DISCLOSURE

The invention concerns an industrial printer suited to receive at least one consumable cartridge,  
5 which comprises means of communication by electromagnetic link (16, 17) with an electronic label (11, 12) disposed on each cartridge (13, 14).

Single figure

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INDUSTRIAL PRINTER SUITED TO RECEIVE AT LEAST  
ONE CONSUMABLE CARTRIDGE

Description

5 Technical field

The present invention concerns an industrial printer suited to receive at least one consumable cartridge.

State of the prior art

10 Applications involving industrial printers, particularly ink jet printers, are developing steadily in the field of industrial marking. Reference can be made, on a purely illustrative basis, to the printing of sell-by dates or batch numbers on food products.

15 The characters are formed through the juxtaposition of ink droplets projected onto the objects to be marked. In order to operate, these printers require a regular supply of ink. This supply is generally ensured by means of an ink cartridge, or bottle, which remains

20 fixed to the printer as long as all the ink which it contains has not been used. In the case of a deviated continuous jet, the ink may contain volatile constituents which evaporate during the printing process, in quantities which vary according to

25 environmental conditions, particularly according to the ambient temperature. Indeed, the ink not used for printing is continuously recycled by means of a suction circuit. This evaporation must be compensated for by an additional and independent supply of said

30 constituents. This supply is ensured with a cartridge,



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referred to as an additive cartridge, similar to the one containing the ink.

The proper operation of these printers is governed by a number of parameters which must be 5 perfectly controlled in order to obtain a flawless print quality. The parameters related to the quality of the inks or consumables are particularly critical. Indeed, the inks consist of chemical compounds with a time-limited stability. The use of an ink which is no 10 longer valid can result in damage requiring a costly intervention by an after-sales department technician.

This also holds true for the accidental mixing of chemically incompatible consumables, for example using an inappropriate additive. It is important to avoid 15 such errors by providing a system which makes it possible for the printer to clearly identify the nature of the consumables introduced.

The viscosity of the ink is another important parameter, because it has an effect on the drop 20 formation process. It varies, particularly according to the temperature and to the concentration of the volatile constituents. In the case of a deviated continuous jet process, it must be kept within a predetermined range, compatible with this process. 25 This control is ensured by supplying a specific quantity of additive.

Certain printers control the viscosity of the ink with respect to a fixed value, independently of the temperature. Other printers control the viscosity of 30 the ink with respect to a reference value, so as to



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obtain a constant concentration of said volatile constituents.

Such a control process is described in patent application FR-A-8 812 935. Due to the development of 5 industrial marking applications, the inks are becoming increasingly complex and may contain several volatile constituents simultaneously. The reference viscosity value for a given temperature depends on the ratio of each constituent and it is becoming increasingly 10 difficult to store all the corresponding curves in the memory of the printer.

Moreover, there are other operating parameters which depend on the nature of the ink used. In the case of the deviated continuous jet, these include the 15 jet speed and the recovery threshold. The latter parameter is characteristic of the flow in the circuit for recycling the ink not used for printing and it depends on the conductivity of said ink. Devices to control the jet speed and the flow in the recycling 20 circuit are described in patent applications FR-A-88 12935 and FR-A-83 05927, respectively.

Further publications of prior art describe various types of printers.

US-A-5 283 613 describes an electrophotographic 25 reproduction machine, and a control system making it possible to use one or more replaceable cartridges in such a machine. This system comprises two memories associated with the cartridge, i.e. an electronic computation memory and an electronic flag memory to 30 store the number of print-outs performed with the



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cartridge and to verify unauthorized interventions on the first memory, respectively.

JP-A-5 193 127 describes an ink jet printer which uses a cartridge with a plug-in print head comprising a 5 memory in which the print control parameters and program are recorded.

EP-A-478 019 describes a cartridge discrimination system for color printing devices. These cartridges are toner cartridges including a hollow container to 10 receive the powder toner and a magnetic card to indicate the cartridge type or position.

EP-A-412 459 describes an ink jet printing device using removable cartridges. Various information defining the characteristics of the ink used is 15 contained on these cartridges, in the form of resistance values. When a cartridge is inserted, various contacts read the resistance value and use this value as data characterizing the ink in a table stored in a memory of the printing device.

US-A-5 208 631 describes a system to identify 20 colorimetric toner properties in a cartridge of a reproduction machine. This system includes a Programmable Read-Only Memory (PROM), located in the cartridge, containing the specific coordinates of the 25 color coordinate system entered in the database of the machine to classify the color data. The reproduction machine comprises a developer cartridge to develop color images, a controller comprising a decoder to classify the colors in the machine and a card disposed 30 on the developer cartridge including address line,



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power and control contacts electrically connected to the decoder. A memory device supported by the card identifies, in the container, the specific coordinates of a color coordinate system.

5 Contrary to these prior art documents which concern devices for printing documents, the object of the present invention is an industrial printer making it possible to print data on objects, suited to simplify the work of the operator as much as possible.

10 Brief description of the invention

The present invention concerns a printing system comprising an industrial printer and at least one consumable cartridge, each cartridge being equipped with an electronic label, the printer being equipped 15 with means of communication suitable for the establishment of a link with the electronic label of each cartridge, characterized in that the electronic label contains information intended to ensure an optimal operation of the printer, and in that the link 20 is a contactless link by means of radio type electromagnetic waves.

The main advantages of such a contactless communication are the following: to make it possible for each cartridge to be positioned in the printer with 25 a fine precision, to avoid possible soiling at the junction of the cartridge and the printer, and to allow for on-the-fly loading of data, without having to immobilize the cartridge on the conditioning line for an extended period of time after it is filled.



5a

Advantageously, the establishment of the electromagnetic link  
does not require a particular

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intervention by the operator. It can take place at regular intervals.

Advantageously, the electronic label can contain:

- information related to the nature of the consumable product contained in the corresponding cartridge, so as to avoid the accidental mixing of products chemically incompatible with the printer;
- 5 - information related to the manufacture of the consumable product contained in the corresponding cartridge, so as to avoid the use of consumables which are no longer valid;
- 10 - information related to the nature of the consumable product contained in the corresponding cartridge, so as to avoid the unauthorized use of specific consumables;
- 15 - information related to the volume of the corresponding cartridge, so as to control the quantities of consumables consumed by the printer;
- information related to the internal programming 20 of the printer so as to optimize its operation with the consumable product contained;
- messages of logistic or commercial nature, intended to be displayed, upon request, by the printer using the cartridge.
- 25 The electronic label can include the following information:
  - the reference of the consumable product;
  - the batch number of the latter;
  - the date of manufacture of the latter;
  - 30 - the use-by date of the latter;



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- the volume contained in the cartridge;
- the reference viscosity or the viscosity vs. temperature curve;
- 5 - the reference speed and the recovery threshold;
- a serial number specific to the label.

Advantageously, the information is loaded in each electronic label when the corresponding cartridge is filled.

10 Advantageously, the information is saved in the memory of the printer for traceability purposes.

Advantageously, said printer can receive an ink cartridge and an additive cartridge.

Advantageously, said printer is an ink jet printer.

15 Brief description of the drawings

The figure is a schematic illustration of an industrial printer, according to the invention, suited to receive an ink cartridge and an additive cartridge, for example.

20 Detailed description of the invention

An industrial printer 10 according to the invention communicates with electronic labels 11 and 12 associated with an ink cartridge 13 and an additive cartridge 14, respectively. This communication is a 25 contactless communication brought into effect by means of an interface 15 including components 16, 17 suitable for the establishment of an electromagnetic link 18 with each of these labels 11 and 12.

The interface 15 ensures the formatting of the 30 information contained in the labels and transmits them



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to the electronics 19 of the printer 10 in data form (DATA). The internal electronics trigger the communication, for example at regular intervals, by means of a clocking signal (CLK) sent to the interface 5 15.

An electronic label is associated with each cartridge, or bottle of consumable product. It contains information making it possible to optimize the printer's operation and which it can communicate to the 10 printer.

The electronic label contains information related to the consumable product contained in the cartridge, including the following:

- 15 - the reference of the consumable product;
- the batch number of the latter;
- the date of manufacture of the latter;
- the use-by date of the latter;
- the volume contained in the cartridge;
- the reference viscosity or the viscosity vs. 20 temperature curve;
- the reference speed and the recovery threshold;
- a serial number specific to the label.

Advantageously, the information is loaded in the label when the cartridge is filled. It is available in 25 a database, for example, and is called according to the reference of the ink.

Once it has recorded the information contained in the label, the printer can carry out various operations. For example, in the case of the first ink 30 cartridge introduced in the printer, the printer is



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able to program itself according to the values of the reference parameters related to the ink in question. In the case of a printer already in service, the latter is able to verify the chemical compatibility of any new 5 consumable product with those already present. In particular, in the case of the deviated continuous jet, the printer verifies the compatibility of the ink and of the additive introduced. If an anomaly is detected, the printer does not draw the consumable product 10. contained in the new cartridge. The printer can also verify that the use-by date of the inks has not been exceeded.

The printer can save, in its memory, the information recorded when each new cartridge is 15 introduced, particularly the batch numbers. These records can be recalled during a maintenance intervention so as to determine that the printer has been in contact with a given batch of consumables, for which an abnormal behavior has been observed subsequent 20 to its manufacture.

These records can also be utilized in the case of inks allotted for confidential applications, so as to verify that a given batch of inks has been used in a given quantity on a given printer. It is also 25 possible, with appropriate software, to forbid the use of certain ink references by unauthorized printers.

It is also possible to store, in the label, information related to ink utilization safety procedures, or even information of logistic or



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commercial nature, i.e. addresses of distributors, advertising messages, etc.

Advantageously, according to the invention the information contained in the label is read without contact with the latter, by means of electromagnetic waves. Such labels are available for standard frequency bands, such as 125 kHz, for example. Such a contactless communication makes it possible for the cartridge to be positioned in the printer with a precision in the order of one millimeter. It makes it possible to avoid possible soiling at the junction of the cartridge and the printer. Finally, it allows for on-the-fly loading of data, without having to immobilize the cartridge on the conditioning line for an extended period of time after it is filled.

The establishment of a contactless communication does not require a particular intervention by the operator. It can take place at regular intervals, for example every ten seconds. When a new ink cartridge is introduced, part of the data contained in the new label is different and the printer records these differences upon the establishment of the next communication.

The invention is particularly applicable to the inks, or consumables, used by ink jet printers, especially those implementing the deviated continuous jet technique, but it may also apply to the consumables of any industrial marking installation.



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## THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A printing system comprising an industrial printer and at least one consumable cartridge, each cartridge being equipped with an electronic label, the printer being equipped with means of communication suitable for the establishment of a link with the electronic label of each cartridge, characterized in that the electronic label contains information intended to ensure an optimal operation of the printer, and in that the link is a contactless link by means of radio type electromagnetic waves.
2. A system according to claim 1, characterized in that the establishment of the electromagnetic link takes place at regular intervals, without requiring a particular intervention by the operator.
3. A system according to claim 1, characterized in that the information is related to the nature of the consumable product contained in the corresponding cartridge.
4. A system according to claim 1, characterized in that the information is related to the manufacture of the consumable product contained in the corresponding cartridge.
5. A system according to claim 1, characterized in that the information is related to the volume of the corresponding cartridge.
6. A system according to claim 1, characterized in that the information is related to the internal programming of the printer.
7. A system according to claim 1, characterized in that the information consists of messages of logistic or commercial nature, intended to be displayed, upon request, by the printer.
8. A system according to claim 1, characterized in that the information includes one or more of the following:
  - the reference of the consumable product;
  - the batch number of the latter;
  - the date of manufacture of the latter;
  - the use-by date of the latter;
  - the volume contained in the cartridge;
  - the reference viscosity or the viscosity vs temperature curve;
  - the reference speed and the recovery threshold;
  - a serial number specific to the label.



9. A system according to any one of the prior claims, characterized in that the information is loaded in each electronic label when the corresponding cartridge is filled.

5 10. A system according to any one of the prior claims, characterized in that the information is saved in the memory of the printer for traceability purposes.

11. A system according to any one of the prior claims, characterized in that it can receive an ink cartridge and an additive cartridge.

10 12. A system according to any one of the prior claims, characterized in that the printer is an ink jet printer.

13. A printing system substantially as described herein with reference to the accompanying drawings.

Dated this thirteenth day of September 1999

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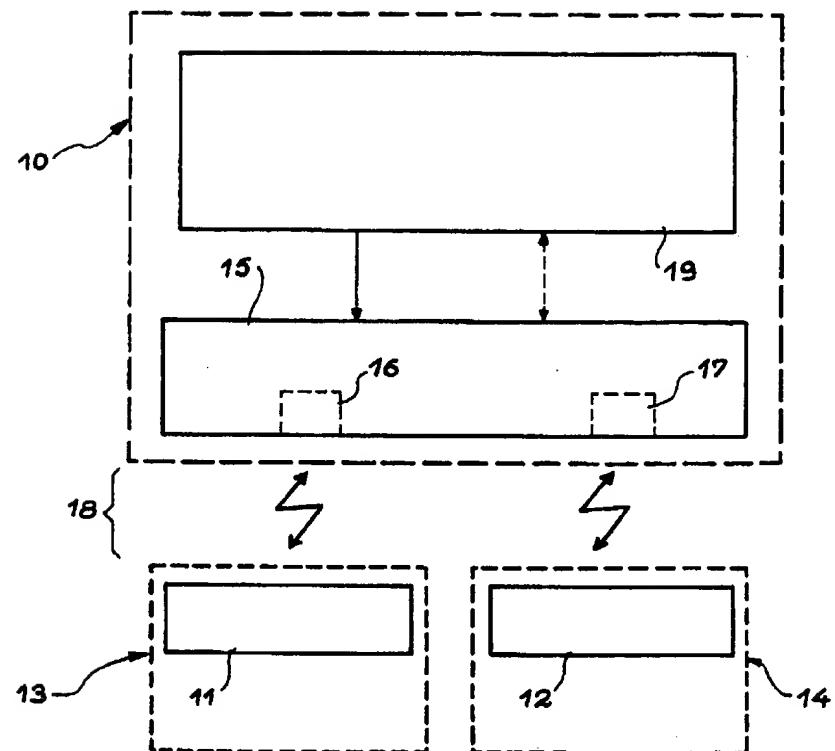


Fig. 1

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